

Chapter 7:
Ecological & Biological Diversity of the Apache-Sitgreaves
National Forests
In
Ecological and Biological Diversity of National Forests in
Region 3

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SAVING THE LAST GREAT PLACES ON EARTH

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Introduction

The Apache-Sitgreaves National Forest is one of 11 National Forests of the U.S. Forest Service (USFS) Southwestern Region (Region 3) and comprises approximately 10% of the total area of Region 3 Forests, not including the Cibola National Grasslands. This Forest encompasses approximately 2,015,500 acres (815,644 hectares) in east-central Arizona along the Mogollon Rim and White Mountains. Elevation on the Forest ranges from approximately 3,500 ft. (1,067 m) to nearly 11,500 ft. (3,505 m) on Mount Baldy.

The geographic location of the Apache-Sitgreaves, coupled with a wide elevational gradient, provides suitable conditions for a myriad of vegetation systems and a multitude of organisms that inhabit them. The Apache-Sitgreaves is also home to the headwaters of a number of important rivers that originate in the White Mountains including the Black, Little Colorado and San Francisco Rivers. These rivers, along with others in the area, are of critical conservation concern as they host many vegetation systems and organisms which are limited in distribution and imperiled in the Southwest.

The goal of this chapter is to synthesize information from existing regional-scale assessments to identify important ecological and biological values that occur on the Apache-Sitgreaves National Forest and highlight information that may be pertinent to forest planning. Information from five assessments was synthesized for the Apache-Sitgreaves National Forest, including:

- Distribution and extent of potential natural vegetation types (PNVTs)
- Distribution and condition of grassland systems
- Distribution of native fish species
- Plant and animal species richness and their conservation statuses
- Conservation areas and targets associated with Ecoregional Assessments

These types of information may be useful within the forest planning process for evaluating the suitability of current management activities and land management designations, identifying ecological characteristics that may be considered in developing desired conditions, and identifying species that may need special consideration because of continuing threats to their existence. Detailed descriptions of these datasets and the methods used to analyze them are available in Chapter 2. A summary and analysis of these assessments and comparisons of the Apache-Sitgreaves National Forest to other major landowners in the Southwest (Arizona and New Mexico) and National Forests in Region 3 is provided in Chapter 3.

Results

I. Potential Natural Vegetation Types within the Apache-Sitgreaves National Forests

Data from the Southwest Regional Gap Analysis Project (SWReGAP; USGS National Gap Analysis Program 2004) were used to characterize the extent of potential natural vegetation types (PNVTs) on the Apache-Sitgreaves National Forests. PNVTs represent the climax vegetation type that would dominate a site under natural disturbance regimes and biological processes. PNVTs were used to summarize vegetation for this analysis because of their relevance to the characterizations of historic range of variability and vegetation models being developed for PNVTs in preparation for forest planning. For this analysis, the extent and proportion of each PNVT on the Apache-Sitgreaves was summarized, as well as the proportion of each PNVT within Region 3 that occurs on the Apache-Sitgreaves National Forests. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and information comparing PNVTs on the Apache-Sitgreaves to other major landowners in the Southwest and National Forests within Region 3 is available in Chapter 3.

Eighteen PNVTs were identified on the Apache-Sitgreaves National Forests (Figure 7-1). Nearly 79% of the Apache-Sitgreaves National Forests is comprised of only three PNVTs. These include ponderosa pine forest (46.0%), pinyon-juniper woodland (19.0%), and Madrean encinal woodland (13.7%; see chapter 2 for descriptions of PNVTs). Approximately 19% of the Apache-Sitgreaves consists of mixed conifer (7.3%), semi-desert grassland (3.7%), Great Basin/ Colorado Plateau grassland and steppe (3.1%), sub-alpine grassland (2.8%), aspen forest and woodland (1.4%), and spruce-fir forest (1.0%). The remaining 2% of the Forests is comprised of relatively small areas of the nine other PNVTs (Table 7-1).

Figure 7-1. Distribution of potential natural vegetation types on the Apache-Sitgreaves National Forests. Map was created using data from the Southwest Regional Gap Analysis Project (SWReGAP; U.S. Geological Survey National Gap Analysis Program. 2004). SWReGAP vegetation types were aggregated and converted to potential natural vegetation types. See Chapter 2 for more information regarding methods used. SWReGAP data have not been accuracy tested and are based on satellite imagery. Therefore, SWReGAP may not be appropriate at fine spatial scales.

Table 7-1. Approximate area (in acres) and percent of total area of each potential natural vegetation type on the Apache-Sitgreaves National Forests. Areas were calculated using data from the Southwest Regional Gap Analysis Project (SWReGAP). SWReGAP land cover types were aggregated and converted to potential natural vegetation types. See Chapter 2 for more details on methods utilized.

Potential Natural Vegetation Type	Total Area (acres)	Percent of Total Area (%)
Aspen Forest and Woodland	2,900	1.4
Desert Communities	800	<0.1
Disturbed/Altered (quarries and mines)	3,000	0.2
Great Basin/ Colorado Plateau Grassland and Steppe	62,500	3.1
Interior Chaparral	18,000	0.9
Madrean Encinal Woodland	275,300	13.7
Madrean Pine-Oak Woodland	16,600	0.8
Mixed Broadleaf Deciduous Riparian Forest	100	<0.1
Mixed Conifer Forest	146,300	7.3
Montane Willow Riparian Forest	2,500	0.1
Pinyon-juniper Woodland	381,700	19.0
Ponderosa Pine	926,400	46.0
Sagebrush Shrubland	700	<0.1
Semi-desert Grassland	74,100	3.7
Spruce-fir Forest	18,500	1.0
Sub-alpine Grassland	56,800	2.8
Urban and Agricultural Area	1,200	0.1
Water (open water)	2,000	0.1
Total	2,015,500	

The Apache-Sitgreaves is responsible for managing large proportions of certain PNVTs found throughout Region 3 National Forests. For example, approximately 18% of sub-alpine grasslands on Region 3 Forests can be found on the Apache-Sitgreaves. Furthermore, the Apache-Sitgreaves manages 16% of ponderosa pine forests, 12% of mixed conifer forests, 11% of pinyon-juniper woodlands, and 10% of Madrean encinal woodlands on Region 3 lands (Figure 7-2).

Figure 7-2. Percent area of cover of each potential natural vegetation type that occurs on the Apache-Sitgreaves National Forests in relation to all Region 3 National Forests combined. Analysis was conducted using data from the Southwest Regional Gap Analysis Project (SWReGAP). See Chapter 2 for information regarding the limitations of SWReGAP.

II. Distribution and Condition of Grasslands

The Arizona Statewide Grassland Assessment (Schussman and Gori 2004, Gori and Enquist 2003; available at <http://www.azconservation.org>) was used to identify the extent, distribution, and condition of historic and current low-elevation (<5000 ft) grasslands on the Apache-Sitgreaves National Forests. This statewide assessment (which also includes the portions of southwest New Mexico and Mexico that are within the Apache-Highlands Ecoregion; Figure 2-1 in Chapter 2) was developed through a combination of expert-based mapping and intensive, quantitative field sampling to verify and improve accuracy. Grassland condition was assessed and assigned to condition classes based on native/non-native grass dominance and cover, shrub cover, and erosion severity. For the purposes of this analysis, condition classes were aggregated into five grassland condition types (Table 2-1 in Chapter 2): open native, restorable native, non-native, former, and transitional grasslands. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and information comparing the extent and distribution of grasslands on the Apache-Sitgreaves to other major landowners and National Forests within Region 3 is available in Chapter 3. It is important to note that significant areas of montane and subalpine grasslands occur on the Apache-Sitgreaves National Forests (White 2002). However, these grasslands were not address in the Statewide Asessment and are not included in these analyses.

The Arizona Grassland Assessment identified approximately 346,700 acres of extant and historic grasslands on the Apache-Sitgreaves National Forests (Table 7-2), representing 16.4% of the Forests. An additional 23,600 acres of historic grassland were identified; however, the current condition of these grasslands was not determined and these acres are not included in percentage calculations. Overall, the Apache-Sitgreaves National Forests manage 18.3% of all grasslands, 22.6% of restorable grasslands, and 40.3% of former grasslands that occur on National Forests in Arizona. The majority (70.2%) of grasslands on the Apache-Sitgreaves are in restorable native condition, with the remainder (29.8%) in former grassland condition (Table 7-2).

The largest proportions of identified grasslands occur on the Black Mesa (53.4%) and Lakeside (38.4%) Ranger Districts (Table 7-2). All of the grasslands on the Black Mesa District (185,000 acres) were identified as being in restorable native condition, meaning that they have been encroached by shrubs and woody species, but have the potential to be restored to open native condition. This area of restorable grasslands (Figure 7-3) is the largest contiguous area on National Forests in Arizona with this potential. On the Lakeside District, a large proportion (69.5%) of grasslands have become shrub invaded, and have likely undergone a type conversion with little potential to be restored to open native grassland condition.

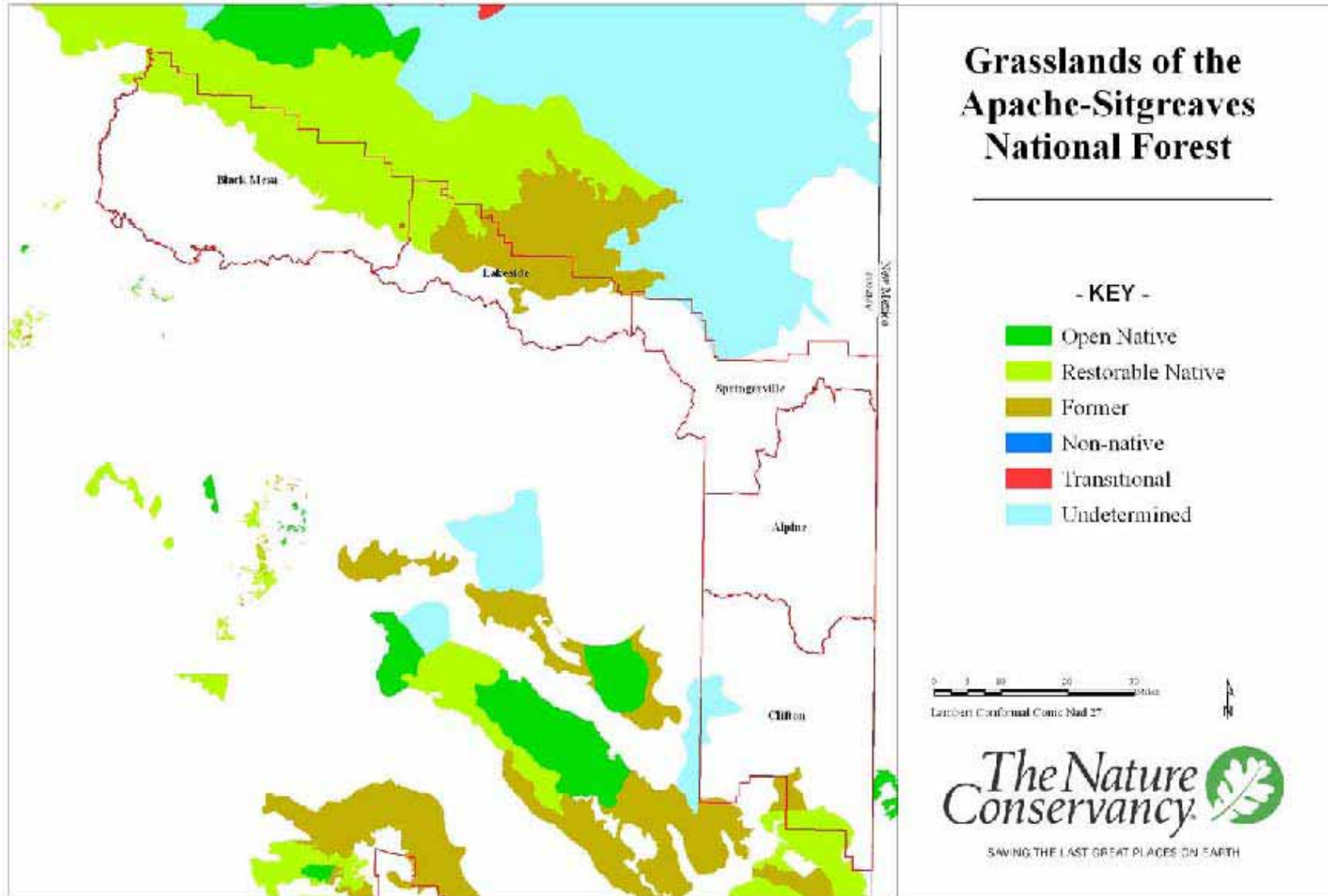


Figure 7-3. Grassland types, based on condition, on five ranger districts on the Apache-Sitgreaves National Forests in Arizona (from Schussman and Gori 2004, Gori and Enquist 2003).

III. Riparian and Freshwater Systems and Species

The Arizona Statewide Freshwater Assessment (Turner and List, *In Press*; available at www.azconservation.org) was used to summarize the occurrence and distribution of stream reaches with native fishes across National Forests in Arizona. This assessment was developed for use in regional planning and includes occurrence information (1975 to present) for 33 native fish species (Table 2-2 in Chapter 2) in streams across all of Arizona. This information was used to identify and summarize the occurrences of each native fish species on stream reaches within the Apache-Sitgreaves National Forests and to summarize the number of native fish species with occurrences on stream reaches on the Forests. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and information comparing the extent of native fish occurrences on the Apache-Sitgreaves to other landowners in the Southwest and National Forests within Region 3 is available in Chapter 3.

According to the Arizona Freshwater assessment, 14 native fish species have occurrences on one or more stream reaches on the Apache-Sitgreaves National Forests (Table 7-3; see Table 2-2 for scientific names). Together, these 14 species have occurrences on approximately 477 miles (62.5%) of the 763 miles of perennial streams that exist on the Apache-Sitgreaves (Table 7-3). Overall, the Apache-Sitgreaves accounts for 41.0% of the perennial streams and 37.5% of the stream reaches with native fish occurrences that exist on National Forests in Arizona.

The speckled dace, Sonora sucker, and desert sucker have the largest distributions on the Apache-Sitgreaves National Forests, while the Gila trout, Gila chub, and spokedace have the smallest (Table 7-3). All of the streams with occurrences of the loach minnow on National Forests in Arizona are on the Apache-Sitgreaves National Forests. In addition, within National Forests in Arizona, over two-thirds of the stream reaches with occurrences of the bluehead sucker (94.6%), Apache trout (80.1%), Gila trout (71.4%), Little Colorado sucker (69.7%), and Little Colorado spinedace (66.3%) occur on the Apache-Sitgreaves (Table 7-3).

Olden and Poff (2005) characterized the temporal trends in native fish distributions within the Lower Colorado River Basin, including 13 of the 14 (92.8%) native fish species on the Apache-Sitgreaves (not including the Little Colorado sucker). Ten of these 13 (71.4%) native fish species on the Apache-Sitgreaves have undergone declines in distribution across the basin, with the remaining three showing slight increases (Table 7-3).

Within National Forests in Arizona, 25.8% of stream reaches with occurrence of 5 or more native fish species occur on the Apache-Sitgreaves National Forests. The Alpine and Clifton Ranger Districts, in particular, have significant lengths of streams with occurrences of 5 or more native fish species (Figure 7-4). Within the Apache-Sitgreaves National Forests, these two districts also have the largest lengths of streams with native fish species occurrences, as well as the highest number of species (11; Table 7-4). According to the Arizona Freshwater Assessment, 63 stream reaches (ranging from less than one to 49 miles in length) on the Apache-Sitgreaves National Forests have occurrences of native fish species, with the number of species on each reach ranging from 1 to 9 (Table 7-5, Figure 7-5).

The Arizona Freshwater Assessment was developed from existing data sources that document the occurrences of native fish throughout Arizona from 1975 to 2004. Natural resources staff from the Apache-Sitgreaves National Forests reviewed the native fish occurrence information and provided comments based on their knowledge of current native fish distribution. In general, these comments indicated three types of differences (Table 7-6):

1. The contraction of a species' distribution on a reach from occurrences noted in the Freshwater Assessment, including extirpation from the entire reach.
2. An increase in the magnitude of a species' distribution within a stream system
3. Presence of species within a stream system that was not previously documented in the Freshwater Assessment.

Native fish occurrence records were drawn from five sources, including Arizona Game & Fish Department's (AGFD) Heritage Data Management System, SONFISHES database compiled by the late Dr. Wendell Minckley, U.S. Fish and Wildlife Service data, U.S. Forest Service data, and data from AGFD's native fish program. Fish occurrence data from 1975 through September 2004 form the basis of the mapped habitat reaches. Therefore, it is likely that a reduction in the current distribution of a species within a reach compared to occurrence information in the Freshwater Assessment indicates an actual contraction in the species distribution. These reductions in distribution may result from a variety of threats that face native fishes in the Southwest, including changes in the timing and magnitude of flows, presence of non-native components, development of obstacles and/or barriers, and degradation of aquatic conditions.

In several cases, comments from the Apache-Sitgreaves National Forests noted increased distributions for particular species, both within stream systems where occurrences were documented in the Freshwater Assessment as well as for stream systems where no occurrences were documented. These distribution 'expansions' may be the result of species expanding their ranges through colonization or re-introduction into new areas. However, it may also indicate that new information about the species' presence in these areas has recently become available, and thus was not captured within the Freshwater Assessment.

The review by Apache-Sitgreaves National Forests staff noted differences in distribution for seven native fish species (Table 7-6). Of particular note, a small reach of Stone Creek near the New Mexico border was not documented in the Arizona Freshwater Assessment. This reach includes four native fish species, including desert sucker, Sonora sucker, speckled dace, and longfin dace. The desert sucker and Apache trout were noted as no longer persisting in several areas with occurrences documented in the Freshwater Assessment. In general, the changes noted are significant from a conservation management perspective. To facilitate analyses of changing fish distribution, additional documentation on fish occurrences will be sought from USFS in an effort to update the Freshwater Assessment data set.

Table 7-3. Number of stream miles with occurrences of 14 native fishes on four ranger districts on the Apache-Sitgreaves National Forests in Arizona based on the Arizona Freshwater Assessment (Turner and List, In Press).

Species	Ranger District				Total	% of AZ Forests ^a	% Change in Distribution ^b
	Alpine	Black Mesa	Clifton	Springerville			
Apache Trout	131		4	42	177	80.1	-26.9
Bluehead Sucker		31		22	53	94.6	-3.5
Desert Sucker	112		94	21	227	28.1	-13.5
Gila Chub			22		22	12.5	-15.9
Gila Trout	3		2		5	71.4	-84
Little Colorado Spinedace	14	24		21	59	66.3	14.1
Little Colorado Sucker	14	34		21	69	69.7	
Loach Minnow	64		55	7	126	100.0	-17.9
Longfin Dace	51		100		151	20.5	11.4
Razorback Sucker	12		41		53	20.0	-49.7
Roundtail Chub	19	34	22		75	13.6	-6.2
Sonora Sucker	106		94	18	218	29.8	8.2
Speckled Dace	161	45	103	73	382	44.5	-16.5
Spikedace			20		20	32.3	-45.9

^aPercent of all stream reaches with occurrences on National Forests

^bBased on Olden and Poff (2005)

Table 7-4. Number of perennial stream miles, number of stream miles with occurrences (1975 to present) of one or more native fish species, and number of native fish species with occurrences on five ranger districts on the Apache-Sitgreaves National Forests in Arizona based on the Arizona Freshwater Assessment (Turner and List, In Press).

Ranger District	Perennial Flow (Miles)	Occupied Habitat (Miles)	Number of Native Fish Species
Alpine	358	227	11
Black Mesa	69	45	5
Clifton	135	110	11
Lakeside	35	0	0
Springerville	166	95	8
Total	763	477	14 ^a

^aTotal number of native fish species with occurrences on the Apache-Sitgreaves National Forests. Several species occur on multiple ranger districts.

Figure 7-4. Number of stream miles with varying native fish species richness based on occurrences from 1975 to present (Turner and List, In Press) for four districts on the Apache-Sitgreaves National Forests, Arizona. No native fish occurrences were identified on the Lakeside district.

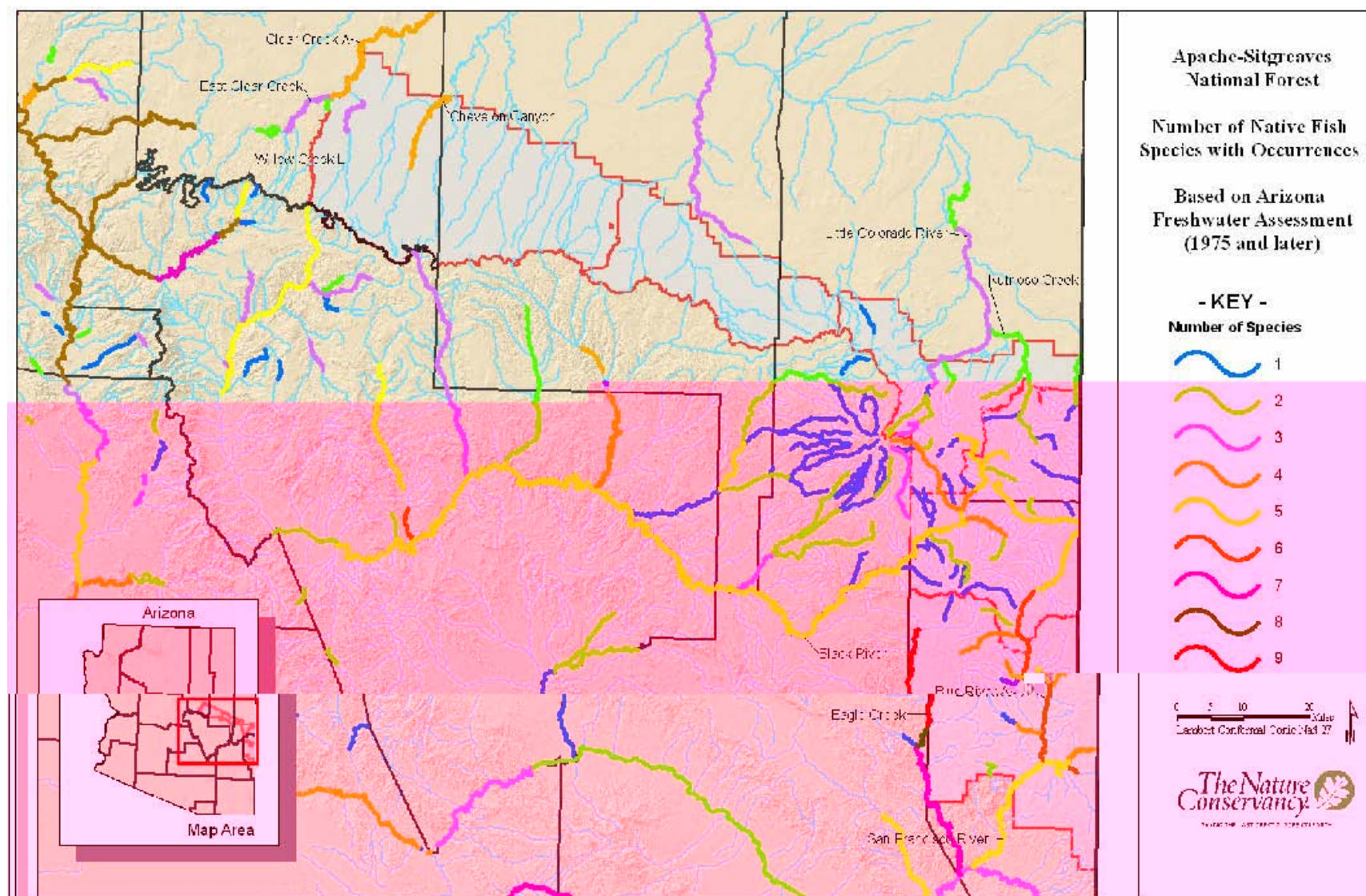


Figure 7-5. Stream reaches (light blue) and perennial stream reaches with varying numbers of native fish species with occurrences on five ranger districts on the Apache-Sitgreaves National Forests in Arizona.

Table 7-5. Stream systems, number of native fish species with occurrences, and the total stream reach length with native fish occurrences for 63 stream systems with native fishes on the Apache-Sitgreaves National Forests in Arizona.

Stream Name ^A	Occupied Habitat (miles)	Number of Native Fish Species
Bear Wallow Creek	4	1
Beaver Creek B	10	4
Black River	19	5
Blue River A	49	6
Boggy Creek B	6	1
Boneyard Creek	6	5
Burro Creek B	3	2
Campbell Blue Creek	20	5
Cave Creek C	2	2
Centerfire Creek	8	1
Chevelon Canyon	20	4
Chitty Canyon Creek	4	1
Clear Creek A	11	4
Coleman Creek	4	2
Colter Creek	4	1
Conklin Creek	5	1
Corduoy Creek B	4	1
Coyote Creek C	6	2
Coyote Creek D	8	2
Deer Creek E	4	1
Dix Creek	2	5
Double Cienega Creek	3	1
Dutch Blue Creek	1	5
Eagle Creek	20	9
East Clear Creek	3	4
East Fork Black River	22	5
East Fork Little Colorado River	10	3
Fish Creek B	14	2
Greer 1	<1	3
Hannagan Creek	4	2
Hannah Springs Creek	1	4
Harden Cienega Creek	2	6
Home Creek	6	1

Table 7-6. Summary of comments from Apache-Sitgreaves National Forests staff providing additional details about native fish distributions relative to information in the Arizona Freshwater Assessment (Turner and List, *In Press*).

Species	Comment Type	Comments
Desert Sucker	Reduced distribution within stream	No longer believed to occur within Burro Creek
	Reduced distribution within stream	On the West Fork of the Black River, no longer believed to occur above the confluence of Thomson Creek
	Expanded distribution to new stream	Occurs on Stone Creek between the confluence of Bob Thomas Creek and the NM border
Sonora Sucker	Expanded distribution to new stream	Occurs on Stone Creek between the confluence of Bob Thomas Creek and the NM border
Speckled Dace	Expanded distribution to new stream	Occurs on Stone Creek between the confluence of Bob Thomas Creek and the NM border
Longfin Dace	Expanded distribution to new stream	Occurs on Stone Creek between the confluence of Bob Thomas Creek and the NM border
Bluehead Sucker	Expanded distribution within stream	Occurs from currently indicated habitat on the Little Colorado River downstream to the Forest Boundary
Loach Minnow	Expanded distribution to new stream	Occurs on Coyote Creek (C) within approximately the first 1000 meters of the confluence with East Fork Black River
Apache Trout	Reduced distribution within stream	Due to presence of a fish barrier, distribution on Coyote Creek (D) does not extend to the Forest boundary
	Reduced distribution within stream	No longer believed to occur on Beaver Creek (B)
	Altered distribution within stream	Currently found in the upper portions of Lee Valley Creek and no longer believed to occur in the lower, mapped portion of Lee Valley Creek
	Expanded distribution within stream	Also believed to occur in the lower portions of both East and West Forks of the Little Colorado River

Species	Comment Type	Comments
	Expanded distribution to new stream	Occurs on Stinky Creek from confluence with West Fork of Black River to within ½ mile of Forest boundary.
	Expanded distribution to new stream	Occurs on Wildcat Creek from Confluence with Centerfire Creek to Confluence of Bonita Rock
	Expanded distribution to new stream	Occurs on Soldier Creek above confluence with Centerfire Creek
	Expanded distribution to new stream	Occurs on The North Fork of KP Creek
	Expanded distribution to new stream	Grant Creek is occupied from just above the confluence with the Blue River to just above the confluence of Strayhorse Creek, including a small portion of Strayhorse Creek

IV. Plant and Animal Species

The R3 Species Database was used to determine plant and animal species richness on the Apache-Sitgreaves National Forests and to characterize the conservation status of these species. The R3 Species Database was created by combining several existing datasets into a single database that provides updated and consistent attributes for species that occur on Region 3 Forests, including taxonomy, NatureServe conservation status rankings, state and federal endangered species listings, and other pertinent conservation status rankings. The database includes all terrestrial and aquatic vertebrate species, and plant and invertebrate species that may be of conservation concern. Non-native aquatic vertebrate species were not included in this analysis. More detailed information on the data and methods used for analysis in this section of the report can be found in Chapter 2. The complete list of species used in this analysis and their conservation status attributes is provided in Appendix 7-A.

Species Richness — Results indicate that the Apache-Sitgreaves National Forests contain at least 537 species of plants and animals (Figure 7-6). This number is conservative, as the dataset used for this analysis only includes organisms that are known to inhabit the Forests, including terrestrial vertebrate species, native aquatic vertebrate species, and plant and invertebrate species of management concern. This does not include two species known to be extirpated on the Forests, the jaguar (*Panthera onca*) and black-footed ferret (*Mustela nigripes*). It is also important to note that the number and type of species inhabiting the Apache-Sitgreaves National Forests likely changes over time.

Figure 7-6. Number of species, by taxon, that inhabit the Apache-Sitgreaves National Forests based on data from the R3 Species Database. The R3 Species Database includes all known terrestrial and aquatic vertebrates, but only known invertebrates and plants of management concern that inhabit Region 3 Forests. For this analysis, of the aquatic vertebrates, only natives were included. Due to the limitations of the R3 Species Database (see Chapter 2 for a complete description of the database), the numbers reported in these results are likely conservative.

Threatened and Endangered Species Listings

Federal listing under the Endangered Species Act — The U.S. Fish and Wildlife Service determines those species that have federal status as endangered or threatened. The agency also lists species as candidate species when there is sufficient information to support a proposal for the endangered or threatened status. Proposed species are those that are proposed in the Federal Register to be listed under section 4 of the Endangered Species Act (ESA) of 1973. Currently, the Apache-Sitgreaves is responsible for managing six federally listed endangered species and eight threatened species. Also, two candidate species and one proposed endangered species occur on the Forests. Refer to Appendix 7-A for a list of threatened and endangered species.

Arizona state listing —The Arizona Game and Fish Department assigns wildlife species whose occurrence is or may be at risk in the state the status of ‘Wildlife of Special Concern’ (WSC). The Arizona Department of Agriculture assigns special state status to plants of conservation concern as highly safeguarded (HS) or salvage restricted (SR). Currently, there are 46 animals and 10 plants with special Arizona state conservation status on the Apache-Sitgreaves National Forests. See Appendix 7-A for a list of known species that inhabit the Forests and their state conservation status.

NatureServe Conservation Status Rankings

Global conservation status rankings (G-ranks) — Nine species (1.7%) of 537 were not included in this analysis because they were not assigned NatureServe global conservation ranks. Results indicate 465 species (88% of subtotal) were ranked as G4/T4 or G5/T5 species (Table 7-7). These are species whose populations are considered ‘apparently secure’ or ‘secure’, respectively. Sixty species (11.3%) were ranked with a global conservation status of G1, G2, G3, T1, T2 or T3, that warrants conservation concern. The remaining species were not ranked or unrankable.

Table 7-7. Number of species, by taxon, that inhabit the Apache-Sitgreaves National Forests with the various global rankings assigned by NatureServe. Nine species are not included in this table because they were not assigned global ranks. G1 = critically imperiled; G2 = imperiled; G3 = vulnerable; G4 = apparently secure; G5 = secure; TNR = not ranked; TU = unrankable; T = infraspecific taxon (subspecies or varieties).

Global Ranking	Amphibian	Bird	Clam	Fish	Insect	Mammal	Plant	Reptile	Snail	Total
G1	0	0	0	2	1	0	0	0	1	4
G2	0	1	0	4	1	0	6	0	0	12
G3	2	3	1	5	2	2	9	1	0	25
G4	2	21	0	2	0	7	6	0	0	38
G5	8	285	0	10	0	73	1	30	0	407
T1	0	0	0	0	0	2	1	0	0	3
T2	0	1	0	0	0	2	2	0	0	5
T3	0	4	0	1	0	3	2	1	0	11
T4	0	3	0	1	0	4	0	2	0	10
T5	1	3	0	0	0	4	0	2	0	10
TNR	0	1	0	0	0	1	0	0	0	2
TU	0	1	0	0	0	0	0	0	0	1

National conservation status rankings (N-ranks) — Of the 537 species analyzed for the Apache-Sitgreaves National Forests, 528 (98.3%) had assigned national conservation status ranks (N-ranks) (Table 7-8). Of these, 449 (85%) were considered secure or apparently secure (N5 and N4, respectively). Sixty-three species (11.9%) had rankings that merit conservation concern on a national scale (N1, N2, or N3). The remaining 16 species (3%) were assigned NNA or NNR rankings. Two species were ranked as extirpated (NH): thick-billed parrot and mexican wolf. See Appendix 7-A for the complete list of species that are known to inhabit the Forests and their associated N-ranks.

Table 7-8. Number of species, by taxon, that inhabit the Apache-Sitgreaves National Forests with the various national rankings assigned by NatureServe. Nine species do not have an assigned national rank. N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure; NNA = not applicable; NNR = not ranked.

N-rank	Amphibian	Bird	Clam	Fish	Insect	Mammal	Plant	Reptile	Snail	Total
N1	0	3	0	2	1	1	2	0	1	10
N2	0	1	0	4	1	3	7	1	0	17
N3	2	11	1	6	1	7	7	1	0	36
N4	3	38	0	3	0	12	5	3	0	64
N5	8	264	0	9	0	73	0	31	0	385
NH	0	1	0	0	0	1	0	0	0	2
NNA	0	3	0	1	0	0	0	0	0	4
NNR	0	2	0	0	1	1	6	0	0	10

Subnational conservation status rankings (S-ranks) — Of the 537 species analyzed for the Apache-Sitgreaves National Forests, 495 (92.1%) had assigned subnational conservation status ranks (S-ranks) in the state of Arizona (Table 7-9). Of these, 264 (53.3%) were considered secure or apparently secure (S5 and S4, respectively). One-hundred and seventy-five species (35.3%) had rankings that merit conservation concern on a state or more local scale (S1, S2, or S3). The remaining 56 species (11.0%) were assigned SNA or SNR rankings. See Appendix 7-A for the complete list of species that are known to inhabit the Apache-Sitgreaves and their associated S-ranks.

Table 7-9. Number of species per taxon currently inhabiting the Apache-Sitgreaves National Forests that are assigned to the various subnational rankings by Arizona Natural Heritage. Forty-two of the 537 species were not assigned a subnational conservation rank by Arizona Natural Heritage. S1 = critically imperiled; S2 = imperiled; S3 = vulnerable; S4 = apparently secure; S5 = secure; SX = presumed extirpated; SNA = not applicable; SNR = not ranked.

S-rank	Amphibian	Bird	Clam	Fish	Insect	Mammal	Plant	Reptile	Snail	Total
S1	0	43	1	4	0	5	3	0	1	57
S2	1	28	0	3	2	5	9	2	0	50
S3	3	34	0	6	0	17	6	2	0	68
S4	2	42	0	0	0	23	0	3	0	70
S5	6	121	0	0	0	42	0	25	0	194
SH	0	0	0	1	1	1	0	0	0	3
SNA	1	24	0	10	0	1	0	0	0	36
SNR	0	7	0	0	1	1	7	2	0	14

Other Conservation Rankings

Birds of Conservation Concern —According to the R3 Species Database, the Apache-Sitgreaves National Forests is home to at least 324 birds, of which 28 (8.6%) are listed by the U.S. Fish and Wildlife Service as a Bird of Conservation Concern (Table 7-10). In all, the U.S. Fish and Wildlife Service lists 131 species of Birds of Conservation Concern, and 21.3% of these inhabit the Apache-Sitgreaves National Forests. Seven of these species also have special conservation status under the state of Arizona (as WSC).

Partners in Flight Watch List — Of the 100 bird species currently on the Partners in Flight Watch List, 30 (30%) can be found on the Apache-Sitgreaves National Forests (Table 7-10). This comprises approximately 9% of the known 324 bird species that inhabit the Forests. Eleven of these species overlap with the U.S. Fish and Wildlife Service Birds of Conservation Concern list, and three are also state Wildlife of Special Concern (WSC).

Table 7-10. Bird species on the Partners in Flight Watch list (P) and the U.S. Fish and Wildlife Service Birds of Conservation Concern (CC) list that inhabit the Apache-Sitgreaves National Forests.

<p>Diurnal Raptors</p> <p>American peregrine falcon* (CC)</p> <p>Common black hawk* (CC)</p> <p>Ferruginous hawk* (CC)</p> <p>Northern harrier (CC)</p> <p>Swainson's hawk (P)</p>	<p>Tyrant Flycatchers</p> <p>Buff-breasted flycatcher* (CC)</p> <p>Greater pewee (CC)</p> <p>Olive-sided flycatcher (P)</p> <p>Willow flycatcher* (P)</p>
<p>Shorebirds</p> <p>Long-billed curlew (CC)</p> <p>Stilt sandpiper (CC)</p> <p>Wilson's Phalarope (CC)</p>	<p>Shrikes and Vireos</p> <p>Arizona bell's vireo (CC)</p> <p>Gray vireo</p> <p>Loggerhead shrike (CC)</p>
<p>Cuckoos and Allies</p> <p>Western yellow-billed cuckoo* (CC)</p>	<p>Jays, Crows, and Allies</p> <p>Pinyon jay (P)</p>
<p>Upland Game Birds</p> <p>Blue Grouse (P)</p> <p>Montezuma quail (P)</p> <p>Scaled quail (P)</p>	<p>Mimids – Catbirds, Mockingbirds, Thrashers</p> <p>Bendire's thrasher</p> <p>Crissal thrasher (CC)</p>
<p>Pigeons and Doves</p> <p>Band-tailed pigeon (P)</p>	<p>Wagtails and Pipits</p> <p>Sprague's pipit*</p>
<p>Owls</p> <p>Burrowing owl (CC)</p> <p>Elf owl</p> <p>Flammulated owl</p> <p>Short-eared owl (P)</p>	<p>Wood Warblers</p> <p>Black-throated gray warbler (CC)</p> <p>Grace's warbler</p> <p>Hermit warbler (P)</p> <p>Olive warbler (CC)</p> <p>Prothonotary warbler</p> <p>Red-faced warbler</p> <p>Virginia warbler (P)</p>
<p>Goatsuckers and Swifts</p> <p>White-throated swift (P)</p>	<p>Tanagers, Cardinals and Allies</p> <p>Dickcissel (P)</p> <p>Painted bunting (P)</p>
<p>Hummingbirds</p> <p>Calliope hummingbird (P)</p> <p>Costa's hummingbird (P)</p> <p>Rufous hummingbird (P)</p>	<p>Emberizine Sparrows and Allies</p> <p>Abert's towhee (P)</p> <p>Baird's sparrow*</p> <p>Black-chinned sparrow</p> <p>Brewer's sparrow (P)</p>
<p>Woodpeckers</p> <p>Lewis's woodpecker</p>	

* = AZ G&F Wildlife of Special Concern (WSC)

Species in bold appear on both lists

Potential Species Lists for Forest Planning

The R3 Species Database was used to identify species that might potentially be considered as species-of-concern and species-of-interest as defined in the USFS planning directives. For the purposes of this analysis, the following definitions used to categorize species were similar, but not identical, to the definitions provided in the directives:

1. Threatened and Endangered Species
 - a. Listed as a threatened or endangered species under the Federal Endangered Species Act
2. Species-of-concern were defined as species that fall in one or more of the following categories:
 - a. NatureServe Global Rank (G/T-rank) of three or less
 - b. Proposed or candidate species under the Federal Endangered Species Act
 - c. Recently (<5 years) de-listed under the Federal Endangered Species Act
 - d. Has been petitioned for federal listing and for which a positive “90-day finding” has been made
3. Species-of-interest were defined as species that fall in one or more of the following categories:
 - a. NatureServe N-rank of N1/N2, or S-rank of S1/S2 in Arizona
 - b. Listed as Wildlife of Special Concern or a plant species with state status in Arizona
 - c. Identified a priority species in the Arizona Comprehensive Wildlife Conservation Strategy
 - d. On the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority List

In particular, the directives provide further criteria that can be used in considering species-of-interest, such as trends, rarity, ranges, and public interest. However, this information was not available in the R3 Species Database and is beyond the scope of this analysis

Federally listed endangered, threatened, candidate, and proposed endangered species — The U.S. Fish and Wildlife Service determines those species that have federal status as endangered or threatened. Currently, the Apache-Sitgreaves is responsible for managing six federally listed endangered species and eight threatened species across five taxa (Table 7-11). The agency also lists species as candidate species when there is sufficient information to support a proposal for endangered or threatened status. Proposed species are those that are proposed in the Federal Register to be listed under section 4 of the ESA (1973). Two candidate species and one proposed endangered species occur on the Forests. These species are included as potential species-of-concern, as suggested by

Forest Service directives. This analysis does not include two species known to be extirpated on the Forests: jaguar (*Panthera onca*) and black-footed ferret (*Mustela nigripes*).

Table 7-11. Endangered and threatened species designated under the Federal Endangered Species Act of 1973 that currently inhabit the Apache-Sitgreaves National Forests. The table includes common names that are recognized by NatureServe.

Taxa	Endangered	Threatened
Amphibian		Chiricahua Leopard Frog
Bird	Brown Pelican	Bald Eagle Mexican Spotted Owl
Fish	Gila Trout Razorback Sucker	Apache Trout Intraspecific Little Colorado Spinedace Loach Minnow Spikedace
Mammal	Hualapai Vole Lesser Long-Nosed Bat Mexican Wolf	
Plant		Sacramento Mountain Thistle

Potential species-of-concern —The Apache-Sitgreaves National Forests are home to at least 49 potential species-of-concern across nine distinct taxonomic groups (Table 7-12). Plants comprise the largest proportion of potential species-of-concern, approximately 39%; birds represent approximately 16%, fish 14%, mammals 12%, insects 8%, reptiles 4%, while amphibians, clams, and snails each constitute 2% of the total. The R3 Species Database, which may not be comprehensive for the Apache-Sitgreaves National Forests, was used to derive these results. Therefore, some species may be absent from these results. When combining both potential species-of-concern and ESA listed threatened and endangered species, plants comprise the largest proportion of species (32%), and fish and birds follow with the next largest proportions (21% and 17% respectively; Figure 7-7).

Table 7-12. Potential species-of-concern on the Apache-Sitgreaves National Forests. Potential species-of-concern include species with NatureServe global ranks (G/T-ranks) of three or less, species that are listed as candidate or proposed under the Federal Endangered Species Act (ESA), have been recently de-listed under ESA, or species which have been petitioned for listing under ESA and for which a positive ‘90 day finding’ has been made.

Taxa/Scientific Name	Common Name	G/T-rank	ESA status	Recently Delisted
Amphibians				
<i>Bufo microscaphus</i>	Arizona Toad	G3		
Birds				
<i>Accipiter gentilis apache</i>	Apache Northern Goshawk	T3		
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover	T3		
<i>Coccyzus americanus occidentalis</i>	Western Yellow-Billed Cuckoo	T2	Candidate	
<i>Euptilotis neoxenus</i>	Eared Quetzal	G3		
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	T3		Yes
<i>Pelecanus erythrorhynchos</i>	American White Pelican	G3		
<i>Pipilo aberti</i>	Abert's Towhee	G3		
<i>Rhynchopsitta pachyrhyncha</i>	Thicked-Billed Parrot	G2		
Clam				
<i>Anodonta californiensis</i>	California Floater	G3		
Fish				
<i>Catostomus clarki</i>	Desert Sucker	G3		
<i>Catostomus discobolus</i>	Bluehead Sucker	G4		
<i>Catostomus insignis</i>	Sonora Sucker	G3		
<i>Catostomus plebeius</i>	Rio Grande Sucker	G3		
<i>Catostomus sp. 3</i>	Little Colorado Sucker	G2		
<i>Gila intermedia</i>	Gila Chub	G2	Proposed	
<i>Gila robusta</i>	Roundtail Chub	G3		
Insects				
<i>Ameletus falsus</i>	False Ameletus Mayfly	G3		
<i>Atrytonopsis deva</i>	Deva Skipper	G3		
<i>Lycaena ferrisi</i>	Ferris' Copper	G1		
<i>Psephenus montanus</i>	White Mountains Water Penny Beetle	G2		
M				
<i>Idionycteris phyllotis</i>	Allen's Big-Eared Bat	G3		
<i>Microtus mogollonensis navaho</i>	Navajo Mexican Vole	T2		
<i>Myotis occultus</i>	Occult Little Brn. Myotis Bat	G3		
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse	T3		
<i>Spermophilus tridecemlineatus monticola</i>	White-Mountain Ground Squirrel	T3		
<i>Zapus hudsonius luteus</i>	New Mexican Jumping Mouse	T2		
Plants				
<i>Asclepias uncialis ssp</i>	Greene M			
<i>Astragalus nutriosensis</i>	Nutrioso Milkvetch	G3		
<i>Brickellia rusbyi</i>	Stinking Brickell-Bush	G3		
<i>Eriogonum ericifolium var.</i>	Heathleaf Wild Buckwheat	T2		

Taxa/Scientific Name	Common Name	G/T- rank	ESA status	Recently Delisted
<i>ericifolium</i>				
<i>Gentianella wislizeni</i>	Chiricahua Gentian	G2		
<i>Helenium arizonicum</i>	Arizona Sneezeweed	G3		
<i>Heuchera eastwoodiae</i>	Senator Mine Allum-Root	G3		
<i>Heuchera glomerulata</i>	Chiricahua Mountain Allum-Root	G3		
<i>Hieracium fendleri</i> var. <i>mogollense</i>	Yellow Hawkweed	T3		
<i>Hymenopappus mexicanus</i>	Mexican Woolly-white	G3		
<i>Packera cardamine</i>	Bitter Cress Groundsel	G3		
<i>Packera quaerens</i>	New Mexico Groundsel	G2		
<i>Penstemon deaveri</i>	Mt. Graham beardtongue	G3		
<i>Penstemon linarioides</i> ssp. <i>maguirei</i>	Maguire's Penstemon	T1		
<i>Puccinellia parishii</i>	Parish's Alkali Grass	G2		
<i>Rumex orthoneurus</i>	Bloomer's Dock	G3		
<i>Salix arizonica</i>	Arizona Willow	G2		
<i>Senecio bigelovii</i> var. <i>bigelovii</i>	Nodding Ragwort	T3		
<i>Trifolium neurophyllum</i>	Mogollon Clover	G2		
<i>Thamnophis eques megalops</i>	Mexican Garter Snake	T3		
<i>Thamnophis rufipunctatus</i>	Narrowhead Garter Snake	G3		
Snails				
<i>Pyrgulopsis trivialis</i>	Black River Springsnail	G1	Candidate	

Figure 7-7. The number of potential species-of-concern (in blue) and federally listed endangered and threatened species (in yellow) by taxon that currently inhabit the Apache-Sitgreaves National Forests. Potential species-of-concern include species with NatureServe global ranks (G/T-rank)

of three or less, species that are listed as candidate or proposed under the Federal Endangered Species Act (ESA), have been recently de-listed under ESA, or species which have been petitioned for listing under ESA and for which a positive ‘90 day finding’ has been made.

Potential species-of-interest —At least 348 potential species-of-interest representing six taxonomic groups currently inhabit the Apache-Sitgreaves National Forests (Figure 7-8). Birds comprise the largest proportion (approximately 77%) of potential species-of-interest. Mammals comprise 14% of the total, while plants, amphibians, fish, and reptiles each make up approximately 2%. Appendix 7-A lists all known terrestrial vertebrates, native aquatic vertebrates, and plants and invertebrate species of management concern on the Apache-Sitgreaves National Forests and identifies those determined as potential species-of-interest.

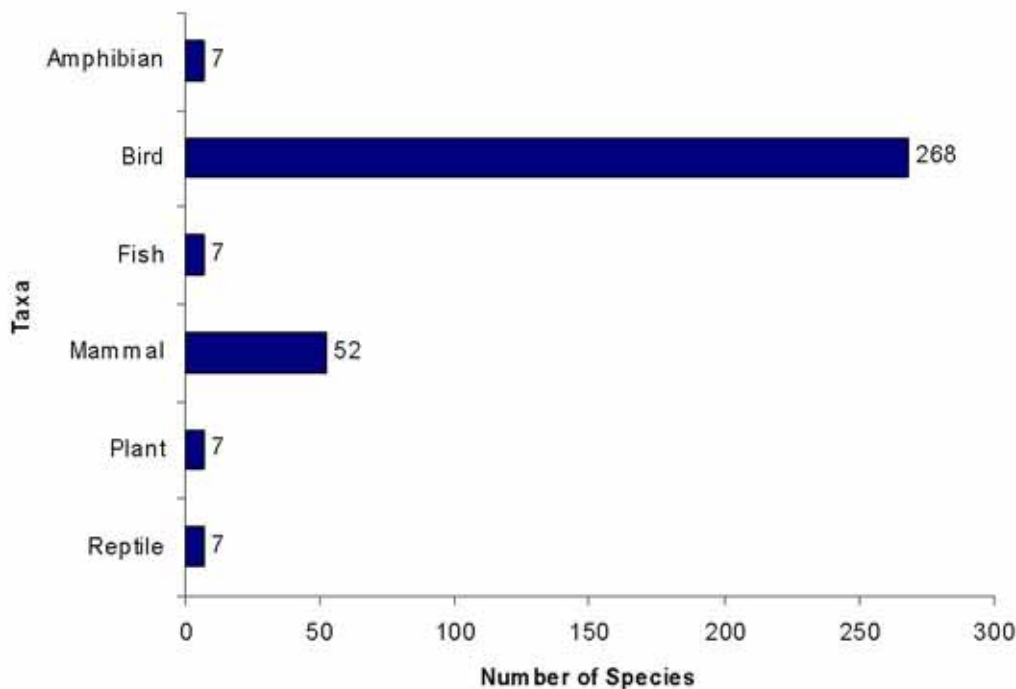


Figure 7-8. The number of potential species-of-interest, by taxon, that currently inhabits the Apache-Sitgreaves National Forests. Species were considered potential species-of-interest if they fell into one or more of the following categories: special state conservation status (WSC, HS, and SR in Arizona); on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list; listed as priority species in the AZ State Comprehensive Wildlife Conservation Strategy; and NatureServe national or subnational conservation rank of N1, N2, S1 or S2. These are the criteria listed in the published Forest Service draft directives (FSH 1909.12 Chapter 40) for determining species-of-interest. Species that were listed as federally endangered or threatened, or that were determined to be potential species-of concern were not included as potential species-of-interest.

Summary – Over three-quarters (76.5%) of all species on the Apache-Sitgreaves National Forests were identified as falling within categories defined by the USFS planning

directives (Table 7-13). While only 9.1% were identified as potential species-of-concern, approximately 65% were identified as potential species-of-interest. Notably, almost one-quarter (24%) of all fish that inhabit the Apache-Sitgreaves National Forests are federally listed threatened or endangered, and another 28% are identified as potential species-of-concern. In addition to the criteria used to define these categories, the R3 Species Database includes additional conservation status information, such as species listed on the Region 3 Sensitive Species List and animals on the state Comprehensive Wildlife Conservation Strategy list. All but two species on the Region 3 Sensitive Species List that inhabit Apache-Sitgreaves National Forests, the cactus mouse (*Peromyscus eremicus*) and Arizona sunflower (*Helianthus arizonensis*), were captured within the categories defined by the directives.

Table 7-13. Number of species identified as endangered or threatened, species-of-concern, species-of-interest, or no category for the Apache-Sitgreaves National Forests based on information in the R3 Species Database.

	Endangered and Threatened		Species-of- Concern		Species-of- Interest		No Category		Total
	#	%	#	%	#	%	#	%	
Amphibians	1	7.7	1	7.7	7	53.8	4	30.8	13
Birds	3	0.9	8	2.5	268	82.7	45	13.9	324
Clam	0	0.0	1	100.0	0	0.0	0	0.0	1
Fish	6	24.0	7	28.0	7	28.0	5	20.0	25
Insect	0	0.0	4	100.0	0	0.0	0	0.0	4
Mammals	3	2.9	6	5.7	52	49.5	44	41.9	105
Plants	1	3.6	19	67.9	7	25.0	1	3.6	28
Reptiles	0	0.0	2	5.6	7	19.4	27	75.0	36
Snail	0	0.0	1	100.0	0	0.0	0	0.0	1
Total	14	2.6	49	9.1	348	64.8	126	23.5	537

V. Ecoregional Assessment Conservation Areas and Conservation Targets

Ecoregional assessments are science-based efforts to identify the minimum set of areas (conservation areas) on the landscape that are necessary to maintain the biological diversity of an ecoregion. The ecoregional assessment process includes the identification of conservation targets (including species, ecological systems, and important biological features) that represent the biological diversity within the ecoregion. Conservation goals (including distribution, size and minimum number of viable occurrences) are established for each conservation target within the ecoregion. An iterative process is used to identify a suite of conservation areas that most efficiently meets the conservation goals for all conservation targets within the ecoregion. A more detailed explanation of the ecoregional assessment process is provided in Chapter 2. For this report, the results of these ecoregional analyses were used to identify the extent and distribution of overlap between conservation areas and ranger districts, roadless areas, wilderness areas (including the Blue Range Primitive Area) and other areas with special designations (including the Wildcat Research Natural Area and numerous wildlife habitat areas) on the Apache-Sitgreaves National Forests. The conservation targets associated with each overlapping conservation area were also identified.

Nine individual conservation areas from ecoregional assessments overlap the Apache-Sitgreaves National Forests (Figure 7-9, Table 7-14), totaling 954,400 acres, or 45.2% of the Forests. Conservation area overlap on individual districts ranged from 10.1% on the Lakeside to 69.2% on the Alpine (Table 7-15). Overall, 24.5% of the total area of these nine conservation areas overlaps the Apache-Sitgreaves National Forests. For four of the nine overlapping conservation areas, more than half of the conservation area overlaps the Apache-Sitgreaves (Table 7-14).

Nearly two-thirds (65.8%) of the area of the Apache-Sitgreaves National Forests overlapped by conservation areas does not have specific land use designations (Table 7-17), while approximately 20% of the overlap area is roadless area and 12.2% is wilderness area. A higher percentage of roadless areas (58.2%) and wilderness areas (52.1%) are overlapped by conservation areas than areas of special designation (39.7%) or areas with no designations (41.6%).

Conservation targets were summarized for all nine conservation areas that overlap with the Apache-Sitgreaves National Forests. A total of 163 conservation targets occur within these conservation areas (Figure 7-10). Of these, 44 (27.0%) are coarse filter targets (ecological systems, communities or features), while 119 (73.0%) are individual species. Sixty-nine (42.3%) targets are associated with riparian and aquatic systems, while 94 (57.7%) are associated with terrestrial habitats (Table 7-16). A complete listing of all conservation targets by taxonomic group for the Apache-Sitgreaves is provided in Appendix 7-B and conservation targets for each conservation area are provided in Appendix 7-C.

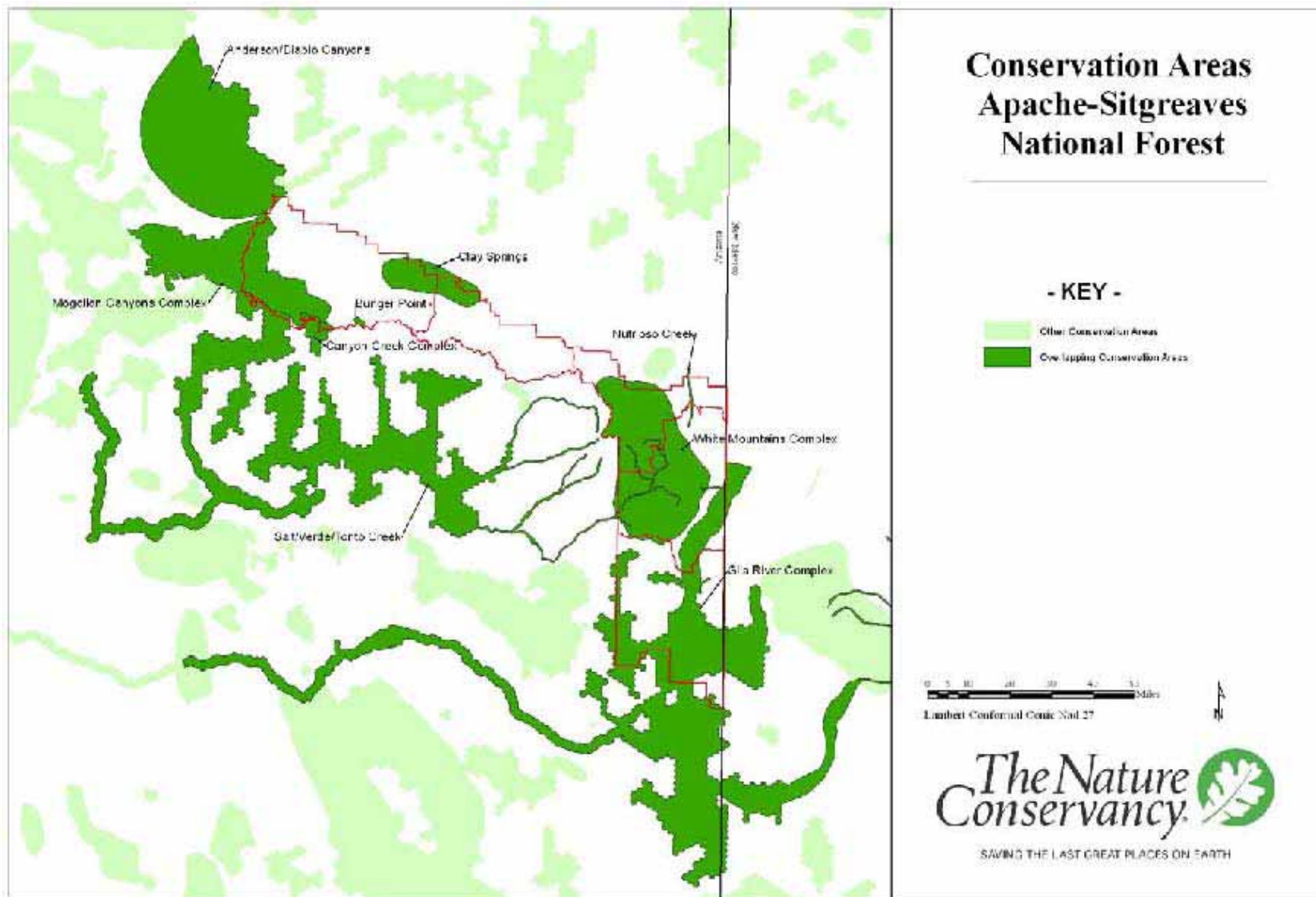


Figure 7-9. Conservation areas (N=8) that overlap the Apache-Sitgreaves National Forests in Arizona.

Table 7-14. Conservation areas (N=9) that overlap five ranger districts on the Apache-Sitgreaves National Forests in Arizona.

Conservation Area	Ranger Districts ^a	Overlap (Acres)	% of Conservation Area
Anderson/Diablo Canyons	BM	1,300	0.2
Bunger Point	BM	2,400	95.1
Canyon Creek Complex	BM	5,900	23.9
Clay Springs	BM,L	78,900	79.9
Gila River Complex	A,C	297,600	21.8
Mogollon Canyons Complex	BM	139,500	41.0
Nutrioso Creek	A,S	3,700	86.2
Salt/Verde/Tonto Creek	A,BM,S	19,100	1.8
White Mountains Complex	A,C,S	405,900	96.7

^aA = Alpine, BM= Black Mesa, C = Clifton, L = Lakeside, S = Springerville

Table 7-15. Extent of overlap between ecoregional conservation areas and five ranger districts on the Apache-Sitgreaves National Forests in Arizona.

District	Number of Conservation Areas	Overlap (Acres)	Percent of District
Alpine	4	311,200	69.2
Black Mesa	6	205,800	33.4
Clifton	2	241,100	48.2
Lakeside	1	27,400	10.1
Springerville	3	169,000	61.8
Apache-Sitgreaves N.F Total	9 ^a	954,400	45.2

^aSeveral conservation areas overlap more than one ranger district

Table 7-16. Number of conservation targets associated with aquatic/riparian and terrestrial habitats for nine conservation areas that overlap the Apache-Sitgreaves National Forests in Arizona.

Conservation Area	Habitat		
	Aquatic/ Riparian	Terrestrial	Total
Anderson/Diablo Canyons	11	22	33
Bunger Point	1	2	3
Canyon Creek Complex	9	7	16
Clay Springs	2	2	4
Gila River Complex	65	53	118
Mogollon Canyons Complex	14	23	37
Nutrioso Creek	7	1	8
Salt/Verde/Tonto Creek	41	47	88
White Mountains Complex	21	32	53

Figure 7-10. Number of conservation targets, by type, that occur on nine conservation areas overlapping the Apache-Sitgreaves National Forests in Arizona.

Table 7-17. Overlap between conservation areas and areas with special designations on the Apache-Sitgreaves National Forests in Arizona.

Designation	Acres within Conservation Areas	% of Conservation Areas	% of Designated Areas
Wilderness Areas	116,200	12.2	52.1
Roadless Areas	188,400	19.8	58.2
Roadless/Special Area	1,400	0.1	51.9
Special Area	19,700	2.1	39.7
No Designation	627,600	65.8	41.6

Discussion

Systems Diversity

Three PNVTs dominate the Apache-Sitgreaves National Forests: ponderosa pine forests, pinyon-juniper woodlands, and Madrean encinal woodlands. In total, they comprise approximately 1,583,400 acres or 79% of the Forests. All three systems are unique to the Southwest or western North America, support a host of distinct organisms that depend primarily on these vegetation systems for their survival, and face various conservation threats.

Ponderosa pine forests are restricted primarily to western North America. Ponderosa pine dependent species in Region 3 include Abert's squirrel (*Sciurus aberti*), which is a species found solely in select pockets of ponderosa pine forests in the four corner states (Arizona, New Mexico, Utah and Colorado) and Wyoming. This system also provides critical habitat to a myriad of other plants and animals, some of which are of state or federal conservation concern, such as the northern goshawk (*Accipiter gentilis*) and the Mexican spotted owl (*Strix occidentalis lucida*), respectively. Currently, research efforts on Southwest forests have largely focused on threats that ponderosa pine systems face, especially that of catastrophic fires. Catastrophic fires can have a negative impact on the biodiversity this system supports. The Apache-Sitgreaves National Forests manage 16% of the ponderosa pine on Region 3 lands, and therefore, has a unique opportunity to use current scientific knowledge and methodologies to help guide management practices for this system.

Pinyon-juniper woodlands are unique to southwestern United States (primarily found in Arizona, Colorado, New Mexico, Nevada, and Utah), and also support a host of distinct organisms. For example, pinyon-juniper woodland provides habitat for the pinyon jay (*Gymnorhinus cyanocephalus*), that depends primarily on this vegetation type for its existence. Currently, the health of pinyon-juniper woodlands faces threats across Region 3 Forest Service lands, primarily due to the combined interactions of drought, bark beetle invasions, and altered fire regimes. Such threats to the system also endanger the existence of the species that depend upon the health of the pinyon-juniper woodlands. The Apache-Sitgreaves manages approximately 11% of all pinyon-juniper woodlands across Region 3 Forest Service lands.

The Madrean encinal woodlands are restricted to extreme southwestern United States (southern Arizona, New Mexico and Texas), where it is considered at its most northern distributional limit. Unique assemblages of vegetation of both tropical and sub-tropical origins make up this system, which supports unique biota of both northern and southern origins. Maintaining these unique assemblages of plant and animal species is critical for sustaining biodiversity in the Southwest and for Region 3 National Forests. Currently, Region 3 Forests manage the largest portion (42%) of Madrean encinal woodlands relative to other major landowners in Arizona and New Mexico, and the Apache-Sitgreaves is responsible for approximately 10% of this system in Region 3 lands.

Grasslands

Grasslands in the Southwest typically maintain high levels of diversity for both plants and animals. In part, this is a result of the blending of several biogeographical regions (Parmenter and others 1995) and the resultant mixing of species from northern and southern regions. Also, southwestern grasslands tend to lie adjacent to other habitat types and along with grassland-specialist species, are used by generalist species from adjacent habitats (Parmenter and Van Devender 1995). This is particularly true on the Apache-Sitgreaves, where altitudinal gradients lead to a blending of low and mid-elevation communities. Notably high diversity of many widespread animal groups, including invertebrates (grasshoppers, termites, and ants) and vertebrates (rodents) are associated with southwestern grasslands. The richness of these species found on southwestern grasslands is tied to the species composition, habitat structure, and productivity of the plant community (Arenz and Joern 1996, Lawton 1983).

Changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacy 1995). Finch (2004) identified and summarized the major threats to grassland biodiversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, erosion, and habitat fragmentation. The Arizona Statewide Grasslands Assessment documented several of these factors as threats to grasslands on the Apache-Sitgreaves National Forests. In particular, over 70% of grasslands on the Apache-Sitgreaves whose current condition were assessed are shrub invaded. Increases in shrub cover within grasslands can significantly affect species richness. While the diversity of some groups, such as birds, may actually increase due to increased vertical structure associated with shrubs or trees (Knopf and Scott 1990) these changes are generally associated with increases in habitat generalists and a sharp decline in grassland specialists (Knopf 1992).

A key characteristic of shrub-invaded grasslands is its restoration potential. The potential to restore shrub-invaded grasslands is affected by a complex web of interacting physical and biological factors that include climate, topography, grazing, introduced/invasive species, and fire. Shrub cover can be reduced with prescribed burns when sufficient fuels are present to carry a fire of adequate intensity (Gori and Backer 2005). Often, the fuels required to allow fires of adequate intensity to achieve this goal are lacking, and areas must be rested from grazing to allow fuels to accumulate. The number of growing seasons of rest needed to accumulate these fuels varies from site to site. Schussman and Gori (2004) estimated that 44% of sites in Arizona could be burned with three growing seasons or less of rest, while the remainder of grasslands would need longer periods of rest.

According to the Arizona Grasslands Assessment, approximately 30% of grasslands on the Apache-Sitgreaves National Forests have exceeded a threshold of 35% shrub cover that indicates a type conversion from grassland to shrubland. This transition can result in a likely permanent loss of grassland systems and the species that depend on them. Even given long periods (50 years) of grazing rest, it is unlikely that these former grasslands can be restored to open native conditions (Hennessey and others 1983). While increases in perennial grass cover may occur (Valone and others. 2002) at certain sites based upon soil type, erosion and shrub species composition, it is unlikely that these sites will accumulate sufficient fine fuels to carry a fire

intense enough to reduce shrub cover and restore open grassland conditions.

Nearly 20% of the grasslands that occur on Region 3 National Forests in Arizona are found on the Apache-Sitgreaves National Forests. Black Mesa, Lakeside, and Clifton Ranger Districts, in particular, have significant areas of contiguous grasslands that are shrub invaded, but have significant potential for restoration. As noted by Finch (2004), maintaining grasslands at sufficient scales is vital for supporting grassland-dependent species, as habitat fragmentation has detrimental effects on grassland biodiversity. These grassland areas provide a valuable opportunity to manage grasslands on the Forests, and to partner with adjacent landowners, to restore grassland function and structure at sufficient scales to ensure the sustainability of species that depend on this system.

Riparian and Aquatic Species and Systems

Aquatic and Riparian systems are obviously an important component of the diversity that exists on the Apache-Sitgreaves National Forests. According to Arizona Freshwater Assessment, the Apache-Sitgreaves has the most stream miles with native fish species occurrences and accounts for nearly 40% of all occupied stream miles within Region 3 National Forests in Arizona.

Of the 14 native fish species identified as occurring on the Apache-Sitgreaves, six occur predominately (greater than two-thirds of occurrences) on the Apache-Sitgreaves, including all occurrences of the loach minnow.

Based on Olden and Poff (2005), it is evident that native fish distributions within the Lower Colorado watershed and throughout the Southwest are dynamic, with the distribution of most native fishes declining. Interestingly, Olden and Poff (2005) found a significant relationship between distributional declines and probability of local extirpation for native fish species. Ten of 13 native fish species on the Apache-Sitgreaves addressed by Olden and Poff (2005) were determined to have declining distributions. The decline in distributions for these species suggests an increased probability of extirpation from the Forests. The Freshwater Assessment clearly identifies areas on the Apache-Sitgreaves with occurrences of these native fish. Within a forest planning context, it may be important to consider the uses and activities that occur within these areas to assess their compatibility with maintaining the distribution and populations of native fish on the Apache-Sitgreaves National Forests.

The causes of decline are many and have varied over time and space. Demands placed upon the region's limited water supplies are increasing as Arizona's population continues to grow, suggesting that activities occurring outside Forest boundaries could play an increasing role in the status of resources USFS is responsible for managing in a sustainable manner. Regional assessment data summarized here demonstrate the important role USFS plays in managing native fish habitat. Changes documented in native fish distribution combined with increasing pressure on limited water supplies indicate that native fish, watershed, and ground-water management may be an important focal area for comprehensive evaluation in forest plan revisions.

Species Richness and Conservation Status

According to the R3 species database, at least 537 terrestrial and aquatic vertebrate species, and plants and invertebrates of conservation concern occur on the Apache-Sitgreaves National Forest. The Apache-Sitgreaves is responsible for managing many of the species of conservation concern on Region 3 Forests. For example, the Apache-Sitgreaves manages 17 federally endangered, threatened, candidate or proposed species. Furthermore, the Apache-Sitgreaves manages 56 species with special state conservation status; 60 species with NatureServe global rankings that warrant conservation concern; 63 species with NatureServe national rankings that warrant conservation concern; and 175 species with NatureServe state rankings that warrant conservation concern. Finally, the R3 Species Database identifies 49 potential species-of-concern; 348 potential species-of-interest; 30 bird species on the Partners in Flight Watch List; and 28 Birds of Conservation Concern. In assessing the species by taxa, over half (52%) of all fish that inhabit the Apache-Sitgreaves National Forests are federally listed threatened or endangered or identified as potential species-of-concern.

A major threat for many species identified as being of conservation concern is the degradation and loss of habitat. Maintaining healthy vegetation systems that support these species should be an important component in sustaining viable populations of species of conservation concern on the Apache-Sitgreaves National Forests. The assessments discussed in this report provide important information on the systems and locations on the Apache-Sitgreaves that are important for maintaining system and species diversity. For instance, the analysis of PNVTs highlighted the important vegetation systems that occur on the Apache-Sitgreaves, which include ponderosa pine, pinyon-juniper, and Madrean encinal. In addition, conservation areas, identified through ecoregional assessments, identify and delineate areas on the landscape that provide the greatest opportunity for sustaining these systems and the species they support.

All of the ranger districts on the Apache-Sitgreaves are overlapped by one or more conservation areas. These conservation areas include 163 conservation targets, including 119 individual species. The specific locations where conservation areas overlap the Apache-Sitgreaves highlight important places for the conservation of ecosystem and species diversity on the Forests and within Arizona and New Mexico. These areas of overlap represent the most viable locations on the Apache-Sitgreaves for sustaining this suite of species, ecological systems, and biological processes.

Relevance to Forest Planning

This analysis of existing regional assessment information identifies important biological and ecological characteristics of the Apache-Sitgreaves National Forests. This information serves as an important baseline for addressing the ecological sustainability component of the forest plan process under the new National Forest Management Act planning regulations, both in terms of ecosystem and species diversity. It may also be useful in understanding the current condition of ecological resources on the Apache-Sitgreaves, identifying ecological characteristics that may be useful in defining desired future conditions, and identifying changes in management necessary to sustain biodiversity. For example, the analysis of ecosystem data demonstrates the variety of systems that occur on the Apache-Sitgreaves, and identifies systems (and their associated species diversity) for which the Apache-Sitgreaves has disproportionate responsibility within the context of Region 3, such as the ponderosa pine and pinyon-juniper forests. This analysis also

demonstrates the importance of grasslands on the Apache-Sitgreaves within a landscape context. The restoration of grasslands on the Apache-Sitgreaves to open native grassland condition, along with the ecological functions that support them, will help promote the large-scale sustainability of important grassland areas within the Southwest.

Along with ecosystems, these results demonstrate the diversity of species that occur on the Apache-Sitgreaves. The identification of a suite of potential species-of-concern and species-of-interest suggests that there are many species whose viability may need to be addressed beyond just providing for healthy ecosystems. The specific needs of these species, as well as their distribution at National Forest and regional scales, may need to be considered to sustain them.

Ecoregional assessments provide a strategic, regional perspective on maintaining biodiversity at large, ecoregional scales that may be useful in forest planning. The suite of conservation areas identified in the ecoregional assessments represents the minimum area on the landscape needed to maintain the region's biodiversity and may serve as priority areas for considering the impacts of management on ecological sustainability. Used within a forest planning context, consideration of conservation areas incorporates, by default, a regional perspective on ecological sustainability and demonstrates consideration of sustainability issues at scales beyond its boundaries.

Within the forest planning framework, it may be useful to evaluate currently allowable land uses and activities within conservation areas and determine associated impacts to biodiversity. A synthesis of conservation area overlap with areas with special designations (e.g. wilderness areas, research natural areas, wildlife habitat areas) on the Apache-Sitgreaves demonstrates the wide variety of current management emphases and activities that occur within conservation areas. The largest proportion of conservation area overlap falls on areas with no special designations, although significant areas also overlap wilderness and roadless areas. It is apparent that achieving biodiversity sustainability on the Apache-Sitgreaves cannot be accomplished entirely within existing designated special areas, and must be accomplished within the varied uses and activities that occur on the Forests. For forest planning purposes, it may be useful to determine the compatibility of forest management and uses within conservation areas with desired biodiversity goals, and identify changes that may be needed to achieve sustainability within these areas.

It is important to note that conservation areas do not imply the need for special protections or blanket restriction of activities. Rather, conservation areas can be viewed as priority areas, based on the large scale perspective of ecoregional assessments, for assessing the impacts of ongoing or planned uses and activities in regards to their compatibility with sustaining biodiversity at regional scales. To aid in these planning efforts, each conservation area has associated with it a suite of conservation targets (species, vegetation communities, and ecological systems, and features) that are representative of the biodiversity in that area. Evaluation of the environmental and ecological needs of these conservation targets, including both the habitats and ecological processes that support them, as well as identifying threats to their sustainability can be used to assess the compatibility of ongoing or planned uses or activities in these areas.

For example, the White Mountains Complex conservation area encompasses 419,800 acres, of which 405,900 (96.7%) fall on the Clifton, Alpine, and Springerville Ranger Districts of the

Apache-Sitgreaves National Forests. Fifty-three conservation targets, including 34 individual species, and 19 communities, ecological systems, and features (see Appendix 7-C), are associated with the White Mountains Complex conservation area. These targets can be used as a tool to assess the compatibility of current or planned activities within the conservation area with sustainability goals. For example, it may be useful to evaluate current conditions of the forest communities within this conservation area relative to the historic range of variability and, if necessary, identify potential changes in management that may move these systems to within historic ranges. Similarly, by identifying the ecological needs of species conservation targets and threats to their sustainability, the compatibility of current activities can be assessed. For example, several of the mammalian conservation targets (New Mexico jumping mouse, Arizona montane vole) within the conservation area are associated with streams, grassy wet meadows, and riparian zones. These species are threatened by agricultural, industrial, and recreational development in these areas, stream alteration, and range management. It may be useful to evaluate management prescriptions within the conservation area and if necessary, identify changes in allowed activities or uses that may reduce or mitigate these threats.

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